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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/074,499
Filing Date: February 13, 2002
Appellant(s): ALOCILJA ET AL.

Ian C. McLeod
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 14 July 2005 appealing from the Office action mailed 28 April 2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

Claims 1, 7, 8, and 14 contain(s) substantial errors as presented in the Appendix to the brief. Accordingly, claims 1, 7, 8, and 14 are correctly written in the Appendix to the Examiner's Answer.

(8) Evidence Relied Upon

6,319,670 B1	Sigal et al	20-11-2001

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-2, 7-9, 14-16, 18-19, and 21 rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al (Biosensor & Bioelectronics (2000), vol. 14, pp. 907-915) in view of Sigal et al (US 6,319,670 B1).

In the instant claims, Kim et al teach a conductimetric immunosensor design comprising a middle section that contains screen-printed thick film electrodes in an interdigitated structure, wherein antibodies are immobilized on the interdigitated area comprising silver electrodes (i.e. first zone contains a first capture agent in a defined area), wherein an anode and cathode are separated and the binding complex on the interdigitated structure is formed in between the electrodes (i.e. between electrodes on different sides of the defined area). See page 911, right column, 1st full paragraph, lines 1-5; and Figure 3, and caption. In addition, Kim et al teach that the immunosensor

comprises a lower section that is defined with immobilized antibody-gold conjugates, wherein the lower section is a glass fiber membrane for sample application (i.e. a second of the zones containing a fluid transfer medium and a second capture reagent), and wherein the gold embodiment of the antibody-gold conjugates contain polyaniline as a conducting polymer (i.e. bound to an electrically conductive polymer). See page 911, right column, 2nd full paragraph, lines 1-7; and Figures 1 and 3-4, and captions. Furthermore, Kim et al teach that after the immunostrips are placed in microwells, solutions within the microwells are absorbed from the bottom of the strips, wherein the medium dissolved the gold conjugate, reaction between the conjugate and the analyte took place to produce a complex, the complex was carried up into the next membrane with the immobilized binder (i.e. complex migrates to the first zone), and a second antigen-antibody reaction formed a sandwich-type immune complex at the gold surfaces, wherein a meter was used to measure the conductivities as responses of the immunostrips with the electrodes to variable analyte concentrations (i.e. alter the conductivity of the defined area to detect the analyte). See page 909, right column, 2nd full paragraph to page 910, left column, 1st paragraph.

However, Kim et al fail to teach that the complex is formed in the absence of any electrically conductive metal particles in the complex (i.e. the use of polyaniline polymer as particles to form a complex).

Sigal et al teach that it is generally known in the art to create microparticles using conductive material from a variety of alternative sources, including metals such as gold, and organic polymers such as polyaniline, and wherein the microparticles can be

entirely composed of a single or a mix of the conductive materials. See column 4, line 52 to column 5, line 32. In addition, Sigal et al teach that it is possible to attached ligands on the outer surface of a microparticle, regardless of the microparticle's composition. See column 4, lines 40-51.

Although Kim et al fail to teach that the complex is formed in the absence of electrically conductive metal particles, it would have been obvious to one of ordinary skill in the art at the time of the invention to substitute an organic polyaniline polymer for gold metal, since Sigal et al teach that the materials to make electrically conductive microparticles are interchangeable and suitable for the same purpose, and since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416. In addition, one of ordinary skill in the art at the time of the invention would have had reasonable expectation of success in substituting polyaniline polymer, as taught by Sigal et al, for the gold bead of Kim et al, since the polyaniline microparticles of Sigal et al are able to immobilize biomolecules, thereby allowing the microparticles to accomplish the binding functions required by Kim et al, and since the polyaniline microparticles of Sigal et al would also be able to immobilize the polyaniline polymer strands on the microparticle surface, thereby allowing the microparticles of Sigal et al to perform the conducting functions required by Kim et al.

With regards to claims 2, 9, and 15, Kim et al teach a cellulose membrane that is an absorption pad as an upper section of the immunosensor strip (i.e. third zone adjacent to the first zone). See Figures 1 and 3, and captions.

With regards to claims 16, 18-19, and 21, Kim et al teach microwells with sample medium into which the immunostrips were placed (i.e. third zone or pad is applied), as stated above. See page 909, 2nd full paragraph, lines 8-18; and Figure 1 and caption. Since the term "pad" has not been defined in the specification, the instant term is considered to be any substrate capable of containing a liquid sample medium.

With regards to claims 7 and 14, Kim et al also teach that voltage was applied across the electrodes (i.e. electrical means) and that conductimetric detection was performed by a conductivity meter, wherein the measurements can determine a transient response after complex formation between antigen and antibody (i.e. measuring means for determining a change in the conductivity of the first area between and after application of the sample). See page 910, left column, 1st paragraph, lines 5-8; and page 912, right column, 2nd full paragraph, lines 1-4.

5. Claims 3, 10, 22, 24, and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim et al (Biosensor & Bioelectronics (2000), vol. 14, pp. 907-915) in view of Sigal et al (US 6,319,670 B1) as applied to claims 1, 8, and 14 above, and further in view of Roberts et al (US 5,958,791).

Kim et al and Sigal et al references have been disclosed above, but fail to teach a multiple array (claims 22, 24, and 26), and also fail to teach that the first defined area has a dimension between the electrodes of 1.0 mm (claims 3 and 10).

Roberts et al reference teaches a test device that includes multiple sets of interdigitated electrode arrays with an area of 6mm x 1mm, in order to perform

simultaneous multiple analyte detection and assay a test sample for a plurality of analytes. See column 18, lines 53-55; column 24, lines 1-6; and column 25, lines 16-20. In addition, Roberts et al teach that the test device is a test strip with capillary flow through an absorbent material with a capture region, wherein the capture region contains binding material that can be an antibody. See column 5, lines 29-42 and 55-56; column 11, lines 29-40; and Figure 1.

It would have been obvious at the time of the invention to modify the method of Kim et al and Sigal et al with a test device that includes multiple sets of interdigitated electrode arrays with an area of 6mm x 1mm, as taught by Roberts et al, in order to perform simultaneous multiple analyte detection and assay a test sample for a plurality of analytes. The electrode arrays of Roberts et al have the advantage of allowing multiple tests to be performed at once, thereby cutting down on experimentation time, and providing motivation for combining the electrode arrays with the device of Kim et al and Sigal et al. One of ordinary skill in the art at the time of the invention would have had reasonable expectation of success in including multiple sets of interdigitated electrode arrays with an area of 6mm x 1mm, as taught by Roberts et al, in the device of Kim et al and Sigal et al, since Kim et al and Sigal et al teach a test strip with an antibody-layered capture region on an interdigitated electrode wherein sample can flow up the strip, and the interdigitated electrode arrays of Roberts et al also include a capture region with immobilized antibody, and are on a test strip that can accommodate capillary flow.

(10) Response to Argument

6. Appellant's arguments with respect to claims 1-2, 7-9, 14-16, 18-19, and 21 have been considered but are moot in view of the new ground(s) of rejection.

However, Appellant put forth issues in the arguments that necessitate a response in spite of the new ground of rejection:

(1) Appellant argues that the teachings of Kim et al would have suggested to one of ordinary skill in the art at the time of the invention to keep the gold particles since Kim et al makes it clear that the gold particles are important for the generation of the biosensor signal, and that one of ordinary skill in the art at the time of the invention would not be lead to substitute a conductive polymeric molecule for the gold particle. See page 15, 2nd paragraph to page 16, last paragraph of the appeal brief.

(2) Appellant points out that, according to MEP 2144.06, in order to rely on equivalence as a rationale supporting an obviousness rejection, the equivalency must be recognized in the prior art, and cannot be based on applicant's disclosure or the mere fact that the components at issue are functional or mechanical equivalents. Appellant also cites *In re Ruff*. See page 18, last paragraph to page 19, 1st paragraph.

(3) Appellant contends that there is nothing in the previously cited references that would suggest the desirability of using conductive polymer beads since the polymer beads would do nothing to address the problems which are associated with using the gold particles of Kim et al. Specifically, Appellant argues that nothing in the previously cited references would suggest that it would no longer be necessary to block the bead surfaces with protein molecules as a blocking agent for reducing non-specific interactions with the bead, and that an ionic polymer shell, and therefore a conduction barrier, would still develop as a result of placing protein molecules on the surface. See page 19, last paragraph to page 20, 1st paragraph.

7. Appellant's arguments have been fully considered but are not considered to be persuasive. With regards to the first point above, Kim et al disclose that the gold particle is important due to the fact that is provides signal generation. However, substitution of the gold particle with a conductive polymer does not preclude generation of a signal. As stated in the rejection supra, Sigal et al teach that conducting particles are made of both metals and polymers, thereby indicating that the materials comprising the particles are interchangeable if they have signal generating properties. Therefore, replacing the gold particle with the conducting polymer taught by Sigal et al would not teach away from the claimed invention since the signal generating properties of the bead would still be present.

8. With regards to Appellant's second point above, *In re Ruff* states that components that are functionally or mechanically equivalent are not necessarily obvious in view of one another. This decision is applied in the case where the issue is whether there is art recognized equivalence for the same purpose, which deals with prior art disclosure of different materials that have the capability of performing the same purpose. However, although Appellant argues that there is no motivation to substitute the polyaniline microparticle as taught by Sigal et al for the gold particle of Kim et al, Appellant's argument is not convincing. Sigal et al specifically states that the microparticles can be fabricated from a variety of metal and non-metal sources, with the microparticles be comprised of either a single type of material or multiple materials, wherein any of the microparticles can be used to immobilize biomolecules and conduct electrical signals. Therefore, since Sigal et al teach that polyaniline microparticles can perform just as well as gold microparticles in the exact same capacity and for the same purpose, one of ordinary skill in the art at the time of the invention would not need motivation to choose one type of microparticle over the other.

In addition, it has been determined that art recognized suitability for an intended purpose is proper grounds for establishing an obviousness rejection, wherein different materials having *known capabilities* to perform an intended function with *known requirements* are obvious over one another. In *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327, 65 USPQ 297 (1945) claims to a printing ink comprising a solvent having the vapor pressure characteristics of butyl carbitol so that the ink would not dry at room temperature but would dry quickly upon heating were held invalid over a

reference teaching a printing kink made with a different solvent that was nonvolatile at room temperature but highly volatile when heated in view of an article which taught the desired boiling point and vapor pressure characteristics of a solvent for printing inks and a catalog teaching the boiling point and vapor pressure characteristics of butyl carbitol. It was stated that "reading a list and selecting a known compound to meet known requirements is no more ingenious than selecting the last piece to put in the last opening in a jig-saw puzzle." See MPEP 2144.07. In addition, *In re Leshin* cited that selection of a known plastic to make a container of a type of plastics prior to the invention was held to be obvious. Furthermore, in *Ryco, Inc. v. Ag-Bag Corp.*, 857 F.2d 1418, 8 USPQ2d 132 (Fed. Cir. 1988), a claimed bagging machine in which the brakes were hydraulic instead of mechanical was held to be obvious over a prior art that disclosed hydraulic brakes for performing the same function. In the case of the instant application, since Kim et al teach that a conductive material is necessary for signal generation, and Sigal et al teach that signal generation could be produced from both metals and polymers, there is not difference in selecting a conductive polymer over a conductive metal since the requirement of signal generation is known to be met for both material types, thereby satisfying the decision in *Sinclair & Carroll Co. v. Interchemical Corp*, and the rulings in *In re Leshin* and *Ryco, Inc. v. Ag-Bag Corp.*

9. With regards to Appellant's third point above, it is clear from Kim et al that the problem of charge transfer due to the conduction barrier was solved by placing strings of polyaniline on the surface of the particles, thereby overcoming the barrier placed by

the ionic polymer shell. Substituting a conductive polymer bead for the gold bead does not negate the necessary placement of the polyaniline strings on the surface. Therefore, although Appellant is correct that the ionic polymer shell would still exist on the surface of a conductive polymer bead, Kim et al has already provided the solution and the conduction barrier would therefore be overcome. Since newly cited Sigal et al reference teaches that the conductive polymer bead can be made of polyaniline, one of ordinary skill in the art at the time of the invention would recognize that there is no barrier to attaching the polyaniline strings to a bead of the same composition.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

This examiner's answer contains a new ground of rejection set forth in section **(9)** above. Accordingly, appellant must within **TWO MONTHS** from the date of this answer exercise one of the following two options to avoid *sua sponte* **dismissal of the appeal** as to the claims subject to the new ground of rejection:

(1) **Reopen prosecution.** Request that prosecution be reopened before the primary examiner by filing a reply under 37 CFR 1.111 with or without amendment, affidavit or other evidence. Any amendment, affidavit or other evidence must be relevant to the new grounds of rejection. A request that complies with 37 CFR

41.39(b)(1) will be entered and considered. Any request that prosecution be reopened will be treated as a request to withdraw the appeal.

(2) **Maintain appeal.** Request that the appeal be maintained by filing a reply brief as set forth in 37 CFR 41.41. Such a reply brief must address each new ground of rejection as set forth in 37 CFR 41.37(c)(1)(vii) and should be in compliance with the other requirements of 37 CFR 41.37(c). If a reply brief filed pursuant to 37 CFR 41.39(b)(2) is accompanied by any amendment, affidavit or other evidence, it shall be treated as a request that prosecution be reopened before the primary examiner under 37 CFR 41.39(b)(1).

Extensions of time under 37 CFR 1.136(a) are not applicable to the TWO MONTH time period set forth above. See 37 CFR 1.136(b) for extensions of time to reply for patent applications and 37 CFR 1.550(c) for extensions of time to reply for ex parte reexamination proceedings.

Respectfully submitted,

Leon Y Lum

A Technology Center Director or designee must personally approve the new ground(s) of rejection set forth in section (9) above by signing below:

George Elliott

Conferees:

Long Le

LONG V. LE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1600

James Housel

JAMES HOUSEL
SUPERVISORY PATENT EXAMINER
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George C. Elliott, Ph.D
Director
Technology Center 1600

APPENDIX TO THE EXAMINER'S ANSWER

The claims appendix in the appeal brief filed 14 July 2005 includes the phrase "in absence of electrically conductive metal particles in the complex" in claim 1 (lines 13-15), claim 7 (lines 15-17), claim 8 (lines 14-15), and claim 14 (lines 16-17), which is the originally filed location of the instant phrase. However, in the amendment after Final, filed 10 June 2005, the phrase was placed in a different section of the instant claims to overcome the rejection made under 35 U.S.C. 112, 2nd paragraph in the Final Office Action: claim 1 (lines 13-14), claim 7 (lines 14-15), claim 8 (lines 13-14), and claim 14 (lines 14-15). It appears as if the instant phrase, in the appeal brief, has been mistakenly placed back in the original position, which would result in the reapplication of the aforementioned rejection under 35 U.S.C. 112, 2nd paragraph. Since the amendment after Final placed the instant phrase in a new location, that location is considered to be the actual claimed location of the phrase. In addition, claims 8 and 14 as presented in the appeal brief lacks some other amendments that were presented in the amendment after Final. Claims 1, 7-8, and 14 have therefore been amended by this appendix to place the instant phrase in the location claimed in the amendment after Final, as indicated below:

1. A biosensor device which comprises: a strip of a substrate having at least two zones wherein a

(1) first of the zones contains a first capture reagent bound to the substrate in a defined area between electrodes on different sides of the defined area for providing an electrical bias to the defined area; and

(2) a second of the zones containing a fluid transfer medium for supplying a fluid to the first zone, wherein the second zone comprises a second defined area containing a second capture reagent bound to an electrically conductive polymer in absence of electrically conductive metal particles, wherein when a fluid sample containing an analyte is bound by the second capture reagent to form a complex ~~in absence of electrically conductive metal particles in the complex~~, the complex migrates to the first zone in the medium and the analyte is bound by the first capture reagent thereby altering a conductivity or resistance of the defined area in the first zone as measured between the electrodes to detect the analyte.

7. A system for detecting an analyte in a fluid sample which comprises:

(a) a biosensor device which comprises:

a strip of a substance having at least two zones wherein a

(1) first of the zones contains a first capture reagent bound to the substrate in a defined area between electrodes on different sides of the defined area for providing an electrical bias to the defined area; and

(2) a second of the zones containing a fluid transfer medium for supplying a fluid to the first zone, wherein the second zone comprises a second defined area containing a second capture reagent bound to an electrically conductive polymer in absence of any

electrically conductive metal particles in the complex, wherein when a fluid sample containing an analyte is bound by the second capture reagent to form a complex ~~in absence of any electrically conductive metal particles in the complex~~, the complex migrates to the first zone in the medium and the analyte is bound by the first capture reagent thereby altering a conductivity or resistance of the defined area in the first zone as measured between the electrodes;

(b) electrical means for supplying an electrical bias between the electrodes; and

(c) measuring means for determining a change in the conductivity or resistance of the first area before and after application of the sample in the second zone to detect the analyte.

8. A biosensor device which comprises: a strip of a substrate having at least two zones wherein a

(1) first of the zones contains a first antibody bound to the substrate in a defined area between electrodes on different sides of the defined area for providing an electrical bias to the defined area; and

(2) a second of the zones containing a fluid transfer medium for supplying a fluid to the first zone, wherein the second zone comprises a second defined area containing a antibody bound to an electrically conductive polymer in absence of electrically conductive metal particles, wherein when a fluid sample containing an antigen which enters the second defined area of the second zone, the antigen is bound by the second antibody~~,~~ which is bound to the conductive polymer~~, forms~~ to form a complex ~~in~~

~~absence of electrically conductive metal particles in the complex~~, the complex migrates to the first zone in the medium and the antigen is bound by the first antibody thereby altering a conductivity or resistance of the defined area in the first zone as measured between the electrodes to detect the antigen.

14. A system for detecting an antigen in a fluid sample which comprises:

(a) a biosensor device which comprises:

a strip of a substance having at least two zones wherein a

(1) first of the zones contains a first antibody bound to the substrate in a defined area between electrodes on different sides of the defined area for providing an electrical bias to the defined area; and

(2) a second of the zones containing a fluid transfer medium for supplying a fluid to the first zone, wherein the second zone comprises a second defined area containing a second antibody bound to an electrically conductive polymer in absence of any electrically conductive metal particles in the complex, wherein when a fluid sample containing an antigen ~~which~~ enters the second defined area of the second zone, the antigen is bound by the second antibody~~,~~ which is bound to the conductive polymer~~,~~ ~~forms~~ to form a complex ~~in absence of any electrically conductive metal particles in the complex~~, the complex migrates to the first zone in the medium and the antigen is bound by the first antibody thereby altering a conductivity or resistance of the defined area in the first zone as measured between the electrodes;

(b) electrical means for supplying an electrical bias between the electrodes; and

(c) measuring means for determining a change in the conductivity or resistance of the first area before and after application of the sample in the second zone to detect the antigen.